MULTIMEDIA UNIVERSITY

TABLE NO: | | |

STUDENT ID NO: | | | | | | | | | | |

VENUE: _____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

DCP5301 – DATA STRUCTURE AND ALGORITHMS

(All sections / Groups)

10 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

Question	Mark
1	
2	
3	
Total	

INSTRUCTIONS TO STUDENT

1. This question paper consists of **9** printed pages (including cover page) with 3 questions only.

2. Answer **ALL QUESTIONS**. All questions carry equal marks. The distribution of the marks for each question is given.

3. Please write all your answers **CLEARLY** in the specific answer boxes provided for each question. Submit this question paper at the end of the examination.

QUESTION 1 [10 marks]

Write the output as the result of execution of the following code segments. [10m]

Num	Code segment	Answer

a)	`stack<int*> s;`
	`int i1 = 3;`
	`int i2 = 4;`
	`int* iptr1 = &i1;`
	`int* iptr2 = &i2;`
	`s.push(iptr1);`
	`s.push(iptr2);`
	`i2 = 5;`
	`while ( !s.empty() )`
	`{`
	`  cout << *s.top() << endl;`
	`  s.pop();`
	`}`	

b)	`queue<int> q;`
	`q.push(5);`
	`q.push(7);`
	`while ( !q.empty() )`
	`{`
	`  cout << q.back() << endl;`
	`  q.pop();`
	`}`	

c)	`list<int> li = {5, 7, 13, 16};`
	`auto iter = li.begin();`
	`iter++;`
	`iter++;`
	`li.insert(iter, 9);`
	`iter = li.end();`
	`iter--;`
	`li.erase(iter);`
	`li.pop_front();`
	`li.pop_back();`
	`for(int i : li)`
	`{`
	`  cout << i << endl;`
	`}`	

d)	`list<int> li1 = {5};`
	`list<int> li2 = {14};`
	`li1.sort();`
	`li2.sort();`
	`li1.merge(li2);`
	`for(int i : li1)`
	`{`
	`  cout << i << endl;`
	`}`	

Continued ...

e)	list<int> li = {3, 5, 7, 8};
	int searchVal[] = {5};
	auto iter = search(li.begin(),
	li.end(), searchVal, searchVal);
	if (iter != li.end())
	{
	cout << "yes" << endl;
	}
	else
	{
	cout << "no" << endl;
	}	

f)	array<int, 6> arr = {13, 21, 5, 7, 1,
	8};
	int binarySearchVal = 9;
	sort(arr.begin(), arr.end());
	bool result =
	binary_search(arr.begin(), arr.end(),
	binarySearchVal);
	if (result)
	{
	cout << "yes" << endl;
	}
	else
	{
	cout << "no" << endl;
	}	

g)	int key = 1004359876;
	int hashValue = key % 1000 / 10;
	cout << hashValue << endl;	

h)	char arr[4] = "bca"; sort(arr, arr+3); cout << arr << endl;	

i)	BinarySearchTree<int> bst;
	bst.insert(20);
	bst.insert(8);
	bst.insert(5);
	bst.insert(10);
	bst.insert(25);
	bst.insert(21);
	bst.insert(33);
	bst.remove(20);
	bst.inorder();	

j)	Graph g;
	g.addEdge("A", "B", 7);
	g.addEdge("A", "C", 5);
	g.addEdge("B", "D", 9);
	g.breadthFirstSearchTraversal("A");	

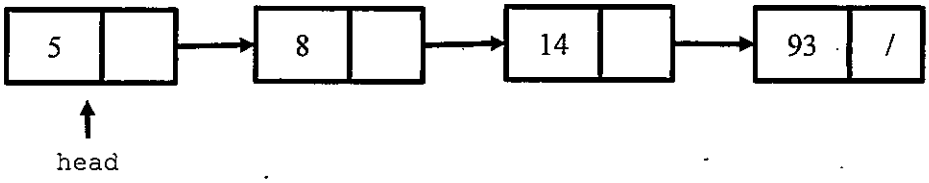
Continued ...

QUESTION 2 [10 marks]

a) Given the following code segment and linked list diagram. [4m]

```
struct Node
{
    int data;
    Node* next;
};

Node* head;
Node* prev;
Node* curr = head;
```



Write code segment to delete the node with value 14 in the linked list. Use delete keyword to delete the node.

Answer:

Continued ...

b) Using binary search algorithm, show step-by-step on how to find **44** in the sorted array of integers **11 22 33 44 55**. Write down the values for first, last and middle for each step. [2m]

Answer:

c) Construct a hash table using the hash function h(x) = x % 7 when the following integers **14 7 21 11 23 13** are inserted in the order given. Calculate the index for each integer key. If collision occurs, resolve it using quadratic probing. Show all the necessary calculation steps clearly in your answer. [2m]

Answer:

Continued ...

d) Sort the integers **2 9 1 6 3 5 4** to ascending order using merge sort algorithm. [2m]

Answer:

Continued ...

QUESTION 3 [10 marks]

a) Write code statements to complete the following function for postorder tree traversal to output element values of all the tree nodes. [3m]

```
struct BinaryNode
{
    int element;
    BinaryNode* left;
    BinaryNode* right;
};

void postorder( BinaryNode* t ) const
{
    if( t != nullptr )
    {
      // Answer:
      [                                    ]
    }
}
```

b) Given the following integers: 56 23 34 74 66 99 60. [3m]

i. Construct the binary search tree.

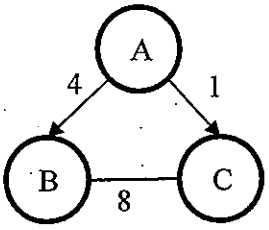
Answer:

Continued ...

ii. Based on the tree that you have constructed, write postorder traversal.
Answer:

iii. Based on the tree that you have constructed, what the tree height is.
Answer:

c) Based on graph below, write down its adjacency matrix representation and adjacency list representation. [2m]

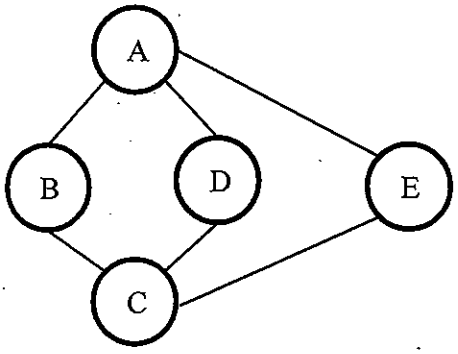


Answer:

Adjacency matrix	Adjacency list

Continued ...

d) Based on graph below, write down the traversal starting at A for depth first search and breadth first search. [2m]



Answer:

Depth first search	
Breadth first search	

End of Page.